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(Reaffirmed 2003)

Indian Standard

ELECTROTECHNICAL VOCABULARY

PART IV ELECTRON TUBES

Section 5 Pulse Terms

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(Continued on page 12)

Indian Standard
ELECTROTECHNICAL VOCABULARY
PART IV ELECTRON TUBES
Section 5 Pulse Terms

0. FOREWORD

0.1 This Indian Standard (Part IV/Sec 5) was adopted by the Indian Standards Institution on 17 April 1972, after the draft finalized by the Electrotechnical Standards Sectional Committee in consultation with the Electron Tubes Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 This standard (Part IV/Sec 5) deals with pulse terms and definitions applicable particularly to electron tubes.

0.3 While preparing this standard assistance has been derived from IEC Document 39A (Central Office) 23 Pulse terminology proposals for changes to clause 2 in Publication 235-1 (1967) ' Measurement of the electrical properties of microwave tubes and valves: Part I General terms and definitions ', issued by International Electrotechnical Commission.

0.4 This standard is one of a series of standards on electron tubes.

1. SCOPE

1.1 This standard (Part IV/Sec 5) deals with pulse terms and their definitions applicable particularly to electron tubes.

2. BASIC TERMS

2.1 Pulse — A brief variation of a quantity above or below a stated datum level; this variation is characterized by a rise and a decay and has a finite duration.

2.2 Voltage Pulse — A pulse in which the varying quantity is a voltage.

NOTE — A typical voltage pulse is illustrated in Fig. 1.

2.3 Current Pulse — A pulse in which the varying quantity is a current.

NOTE — The shape of a typical current pulse is illustrated in Fig. 2.

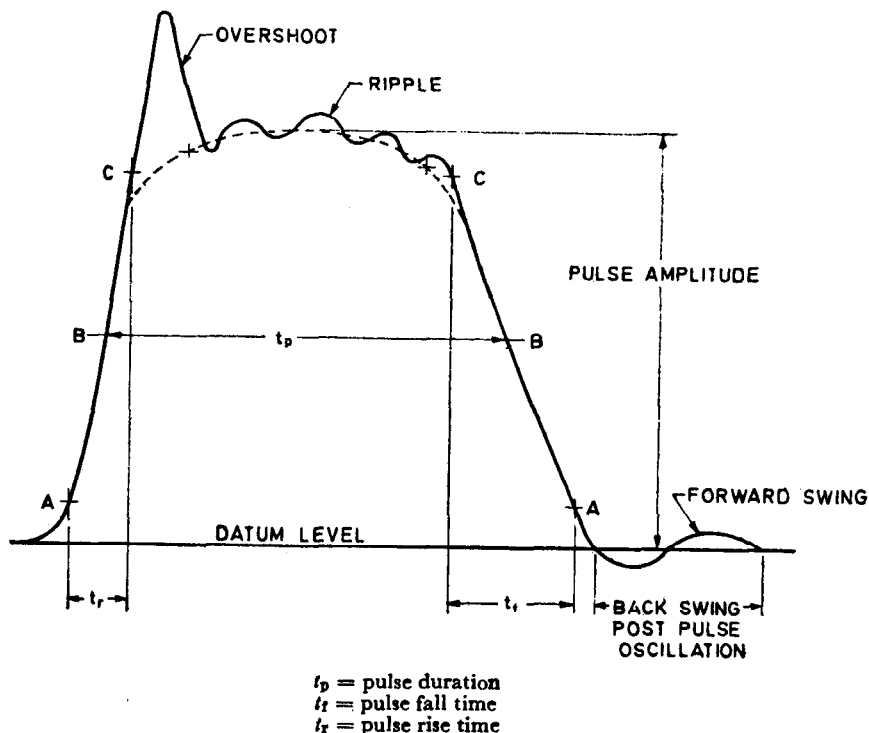


FIG. 1 VOLTAGE PULSE AND PULSE CHARACTERISTICS



FIG. 2 CURRENT PULSE

2.4 RF Pulse — A pulse in which the varying quantity is an rf signal.

3. PULSE WAVE-SHAPE

3.1 Trapezoidal Pulse — A pulse whose wave-shape is a practical approximation of a trapezoid (for example, pulses illustrated in Fig. 1 and 2).

3.2 Pulse Top — That part of a pulse in which the pulse quantity is approximately constant.

3.3 Pulse Overshoot — A short duration surge appreciably above the pulse top immediately following the leading edge of the pulse.

3.4 Post-Pulse Oscillation — Damped oscillation of the pulse quantity which occurs after the finish of the main pulse, comprising back swing and forward swing.

3.5 Back Swing — The excursion of the pulse quantity of opposite polarity to that of the main pulse and which occurs immediately after the main pulse.

3.6 Forward Swing — The excursion of the pulse quantity immediately following the back swing, in opposite polarity thereto.

4. PULSE CHARACTERISTICS

TABLE 1 EXAMPLES OF PULSE QUANTITY PERCENTAGES

NATURE OF TUBE	RF POWER			VOLTAGE			CURRENT		
	A	B	C	A	B	C	A	B	C
Linear ($I \propto V$)	10	50	90	33	70	95	33	70	95
Beam types ($I \propto V^{3/2}$)	10	50	90	10	70	90	10	70	90
Crossed field types (typical)*	10	50	90	10	70-90	90	10	50	90

NOTE — These measurement figures represent typical percentages of pulse amplitude. They are based on power criteria and the measurement points at A, B and C in Fig. 1 are suitably adjusted for voltage and current measurements depending upon the tube type (for example, $I \propto V$ type, beam type, crossed-field type, etc).

*For very short duration pulses, other measuring points may be necessary.

4.1 Pulse Amplitude — The maximum value of the pulse quantity at the top of the pulse determined by the maximum height of the smooth curve, drawn through the average of the variations on the top of the pulse.

NOTE 1 — In the case of a pulse whose duration is of 1 μ s or more, it is usual to ignore overshoots having a duration of less than 10 percent of the pulse duration.

NOTE 2 — In the case of distorted pulses it may be necessary to correct amplitude, as thus defined, to obtain agreement with a measurement of the average of the appropriate pulse quantity throughout the pulse duration (see Fig. 3).

4.2 Pulse Start — That instant at which the pulse quantity has risen to a stated and clearly discernible level above the stated datum level.

NOTE — This value is normally not greater than 10 percent of the pulse amplitude.

4.3 Pulse Finish — That instant at which the pulse has fallen to a stated and clearly discernible level above the stated datum level.

NOTE — This value is normally not greater than 10 percent of the pulse amplitude.

4.4 Pulse Rise Time — The time interval between the instants at which the pulse quantity rises from 10 percent of the pulse amplitude to 90 percent of the pulse amplitude, unless otherwise stated.

4.5 Pulse Rate-of-Rise — The slope of the tangent at a stated point on the pulse leading edge of the pulse characteristic.

4.6 Pulse Fall Time — The time interval between the instants at which the pulse quantity falls from 90 percent of the pulse amplitude to 10 percent of the pulse amplitude, unless otherwise stated.

4.7 Pulse Duration — The time interval between the instants at which the instantaneous value of the pulse quantity equals a stated percentage of the pulse amplitude (*see* Table 1).

5. PULSE DISTORTION

5.1 Capacitive Charging Step — The step on the leading edge of the current pulse due to charging of the tube value capacitance (*see* Fig. 1).

5.2 Pulse Ripple — The deviations of the instantaneous value of the pulse quantity from the smooth curve drawn through the average of the variations on the top of the pulse.

NOTE — It may be expressed either as a percentage of the pulse amplitude or as half the peak-to-peak value.

5.3 Pulse Tilt — An inclination of the top of an otherwise essentially flat-topped pulse.

5.4 Pulse Droop — A distortion of an otherwise essentially flat-topped pulse characterized by a decline of the smooth line drawn through the average of the variations on the top of the pulse (*see* Fig. 3).

NOTE — It is measured between the 20 percent and 80 percent point of the pulse duration unless otherwise stated.

6. PULSE TRAIN

6.1 Interpulse Period — The time interval between the finish of one pulse and the start of the following pulse.

6.2 Pulse Repetition Frequency — The number of times the pulse waveform repeats per stated unit of time (usually per second).

6.3 Pulse Repetition Period — The reciprocal of pulse repetition frequency.

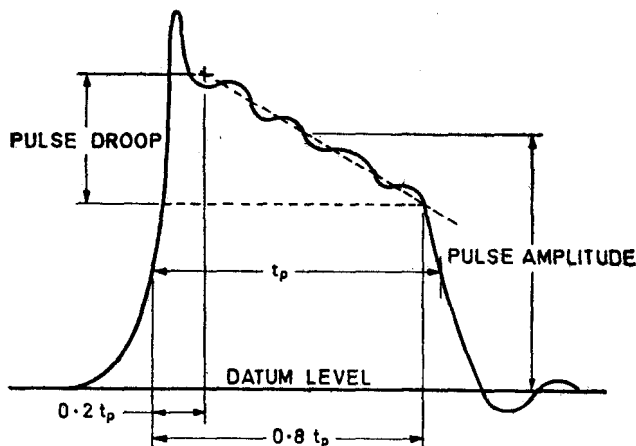


FIG. 3 PULSE DROOP

6.4 Pulse Duty Factor — The ratio of the sum of pulse durations to a stated averaging time. In the case of periodically repetitive pulses, the averaging time is the pulse repetition period.

7. RF PULSE MEASUREMENTS

7.1 Measurement Conditions

7.1.1 'On' Period Conditions — Measurement conditions during that part of an operating cycle in which the tube is conducting.

7.1.2 'On' Period Active Conditions — Measurement conditions during that part of an operating cycle in which the tube or valve is conducting and during the occurrence of an rf pulse.

7.1.3 'On' Period Non-active Conditions — Measurement conditions during that part of an operating cycle in which the tube is conducting but when no rf output pulse occurs.

7.1.4 'Off' Period Conditions — Measurement conditions during that part of an operating cycle in which the tube is non-conducting.

7.2 Pulse Output Power/Peak Pulse Output Power — The ratio of the average output power and the pulse duty factor.

NOTE — The output power is averaged over a stated time interval.

7.2.1 Peak Envelope Power — The maximum value of output power, excluding overshoots in a stated time interval.

7.3 Pulse Stability

7.3.1 Missing Pulse — An output pulse whose energy in the stated frequency band is less than some stated fraction of the energy of a normal output pulse.

NOTE — The stated fraction of the normal output pulse is usually 70 percent.

7.3.2 Missing Pulse Count — A count over a stated period of those input pulses for which corresponding output pulses are missing.

7.3.3 Missing Pulse Factor — The ratio of the missing pulse count to the total count of input pulses, both counts being measured in the same period.

7.3.4 Pulse Starting Stability — The ability of a microwave tube to operate without missing pulses after the first application, in a stated manner, of the operating supply voltage(s). A measure of the pulse starting stability is the missing pulse factor determined directly after a period of rest.

7.3.5 Mismatch Pulse Stability — The maximum value of the missing pulse factor, measured under stated operating conditions, when the phase of the reflection coefficient of a load of specified voltage standing wave ratio (VSWR) is varied over at least 180 degrees.

8. PULSE JITTER

8.1 Pulse Jitter — Random variations in the characteristics of successive pulses, for example energy content, time, frequency or amplitude. It may be expressed as an rms value of the deviations from the average value.

8.2 Pulse Time Jitter — A pulse-to-pulse variation of the time incidence of a given level of the pulse with respect to a given level of the initiating pulse.

8.3 Pulse Frequency Jitter — A pulse-to-pulse variation of the ratio frequency of oscillation, occurring at corresponding instants within the pulse.

8.4 Pulse Amplitude Jitter — A pulse-to-pulse variation of the pulse amplitude of the instantaneous value occurring at corresponding instants within the pulse.

8.5 Pulse Phase Jitter — A pulse-to-pulse variation of the rf phase delay introduced by an amplifier tube occurring at corresponding instants within the phase.

INDEX

NOTE — This index has been prepared in accordance with IS : 1275-1958*. Index numbers are clause numbers.

A

Active conditions, on period 7.1.2

Amplitude

Jitter, pulse 8.4

Pulse 4.1

B

Back swing 3.5

C

Capacitive charging step 5.1

Charging step, Capacitive 5.1

Conditions

Measurement 7.1

Off period 7.1.4

On period 7.1.1

active 7.1.2

non-active 7.1.3

Count, Missing pulse 7.3.2

Current pulse 2.3

E

Envelope power, Peak 7.2.1

F

Factor

Missing pulse 7.3.3

Pulse duty 6.4

Fall time, Pulse 4.6

Finish, Pulse 4.3

Forward swing 3.6

F

Frequency

Jitter, Pulse 8.3

Pulse repetition 6.2

J

Jitter, Pulse 8.1

amplitude 8.4

frequency 8.3

phase 8.5

time 8.2

M

Mismatch pulse stability 7.3.5

Missing

count 7.3.2

factor 7.3.3

pulse 7.3.1

N

Non-active conditions, On period 7.1.3

O

Off period conditions 7.1.4

On period

active conditions 7.1.2

conditions 7.1.1

non-active conditions 7.1.3

*Rules for making alphabetical indexes.

Oscillation, Post-pulse 3.4

Output power

Peak pulse 7.2

Pulse 7.2

Overshoot, Pulse 3.3

P

Period

active conditions, On 7.1.2

Conditions

Off 7.1.4

On 7.1.1

Interpulse 6.1

non-active conditions, On 7.1.3

Pulse repetition 6.3

Phase jitter, Pulse 8.5

Post-pulse oscillation 3.4

Power

Peak

pulse output 7.2

envelope 7.2.1

Pulse 2.1

amplitude 4.1

jitter 8.4

start 4.2

Count, Missing 7.3.2

Current 2.3

droop 5.4

duration 4.7

duty factor 6.4

factor, Missing 7.3.3

fall time 4.6

frequency jitter 8.3

jitter 8.1

Missing 7.3.1

oscillation, Post 3.4

output power 7.2

Peak 7.2

overshoot 3.3

phase jitter 8.5

rate of rise 4.5

repetition

frequency 6.2

period 6.3

ripple 5.2

rise time 4.4

stability 7.3

stability, Mismatch 7.3.5

starting stability 7.3.4

tilt 5.3

time jitter 8.2

top 3.2

Trapezoidal 3.1

Voltage 2.2

R

Rate-of-rise, Pulse 4.5

Repetition

frequency, Pulse 6.2

period, Pulse 6.3

Ripple, Pulse 5.2

Rise time, Pulse 4.4

S

Stability

Mismatch pulse 7.3.5

Pulse 7.3

starting 7.3.4

Starting stability, Pulse 7.3.4

Start, Pulse 4.2

Step, Capacitive charging 5.1

Swing

Back 3.5

Forward 3.6

T

Tilt, Pulse 5.3

Time

jitter, Pulse 8.2

Pulse

fall 4.6

rise 4.4

Top, Pulse 3.2

Trapezoidal pulse 3.1

V

Voltage pulse 2.2

(Continued from page 2)

Panel for Microwave Tubes, ETDC 39 : P5

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